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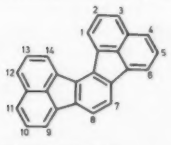

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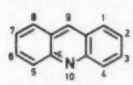

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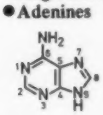

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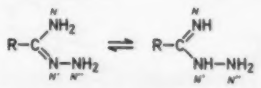

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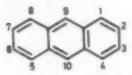

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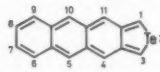

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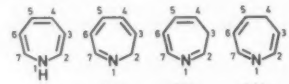

2*H*– 3*H*– 4*H*–

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2*H*–

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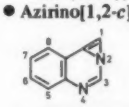

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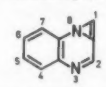

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see: Diazenes

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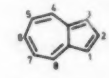

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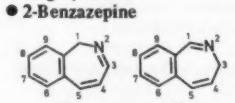

1*H*- 3*H*-

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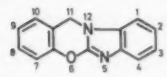

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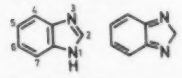

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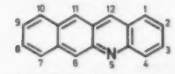
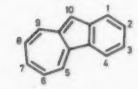
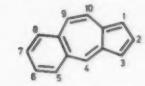
- Ring Synthesis 703
● **Benzo[*b*]acridine**



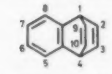
- 5,12-Dihydrobenzo[*b*]acridines
- Ring Synthesis 581
● **Benzo[*a*]azulene**



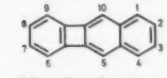
- Ring Synthesis 282 (4359)
● **Benzo[*f*]azulene**



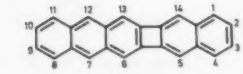
- Ring Synthesis 282 (4359)
● **Benzobarrelenes**



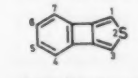
- Ring Synthesis 707
● **Benzo[*b*]biphenylene**



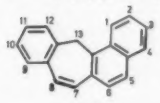
- Ring Synthesis 431
● **Benzo[*g*]cyclobuta[1,2-*b*;3,4-*b*']dinaphthalene**



- 5,5b,6,11,12,13a,14-Octahydrobenzo[*g*]cyclobuta[1,2-*b*;3,4-*b*']dinaphthalenes
- Ring Synthesis 324
● **Benzo[3,4]cyclobuta[1,2-*c*]thiophene**

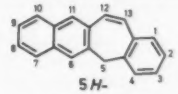


- Ring Synthesis 767
● **Benzo[4,5]cyclohepta[1,2-*a*]naphthalene**



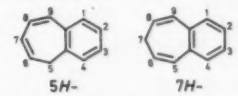
13*H*-

- 7,8-Dihydro-13*H*-benzo[4,5]cyclohepta-[1,2-*a*]naphthalenes
- Ring-Transformation Reactions 614 (4535)
● **Benzo[4,5]cyclohepta[1,2-*b*]naphthalene**



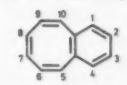
5*H*-

- 12,13-Dihydro-5*H*-benzo[4,5]cyclohepta-[1,2-*b*]naphthalenes
- Ring Synthesis 614 (4535)
● **Benzocycloheptene**

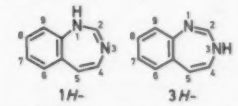


5*H*- 7*H*-

- 5*H*-Benzocycloheptenes
- Ring Synthesis 768
- 7*H*-Benzocycloheptenes
- Ring Synthesis 768
● **Benzocyclooctene**

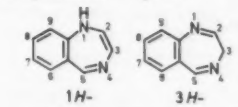


- 7,8-Dihydrobenzocyclooctenes
- Ring Synthesis 769
● **1,3-Benzodiazepine**



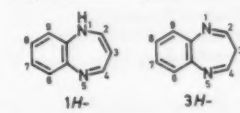
1*H*- 3*H*-

- 2,3-Dihydro-1*H*-1,3-benzodiazepines
- Ring Synthesis 490
● **1,4-Benzodiazepine**



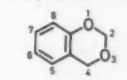
1*H*- 3*H*-

- 2,3-Dihydro-1*H*-1,4-benzodiazepines
- Ring Synthesis 37
● **1,5-Benzodiazepine**

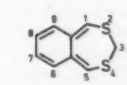


1*H*- 3*H*-

- 3*H*-1,3-Benzodiazepines
- Ring Synthesis 37
- 2,3,4,5-Tetrahydro-1*H*-1,5-benzodiazepines
- Ring Synthesis 578, 657
● **1,3-Benzodioxin**



- Ring Synthesis 133 (4314)
● **2,4-Benzodithiepin**

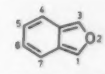


- 1,5-Dihydro-2,4-benzodithiepins
- Ring Synthesis 720
● **1,4-Benzodithiin**

- 1,4-Benzodithiins
- from Like Ring Skeletons 451
- 2,3-Dihydro-1,4-benzodithiins
- Ring Synthesis 451
● **1,3-Benzodithiole**

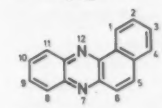
- from Like Ring Skeletons 168, 170, 411 (4450), 436
- Ring Synthesis 36, 411 (4450)
- Ring-Cleavage Reactions 171, 411 (4450)
● **1-Benzofuran**

- 1-Benzofurans
- Reactions with Retention of the Ring Skeleton 717
- 2,3-Dihydro-1-benzofurans
- from Like Ring Skeletons 717
- Ring Synthesis 214
- 2,4,5,6,7,7a-Hexahydro-1-benzofurans
- Ring Synthesis 131 (4303)
- Octahydro-1-benzofurans
- Ring Synthesis 482 (4498)
● **2-Benzofuran**

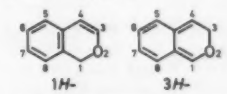


- Ring-Transformation Reactions 487
● **Benzofurazan**

- Benzofurazan *N*-Oxides (Benzofuroxans)
- Ring-Transformation Reactions 415, 703
● **Benzo[*a*]phenazine**

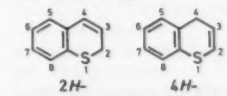


- Ring Synthesis 419
● **2-Benzopyran**



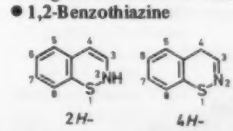
1*H*- 3*H*-

- 1*H*-2-Benzopyrans
- from Like Ring Skeletons 797
- Isochromans
- Ring Synthesis 98, 624, 797
- Ring-Transformation Reactions 132 (4308)
● **1-Benzothiapyran**



2*H*- 4*H*-

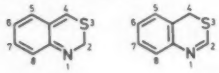
- Ring Synthesis 740
- Ring-Transformation Reactions 350
● **1,2-Benzothiazine**



2*H*- 4*H*-

- Fusion of New Rings 289 (4393)

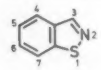
● 3,1-Benzothiazine



2*H*- 4*H*-

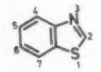
- Ring-Cleavage Reactions 339 (4407)
- Ring-Transformation Reactions 339 (4407)

● 1,2-Benzothiazole



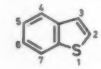
- 2,3-Dihydro-1,2-benzothiazoles
- from Like Ring Skeletons 166

● 1,3-Benzothiazole



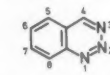
- from Like Ring Skeletons 208
- Annelation Reactions 511

● 1-Benzothiophene



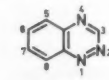
- Ring Synthesis 289 (4391)
- Annelation Reactions 201 (4340)

● 1,2,3-Benzotriazine



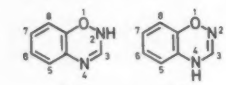
- 3,4-Dihydro-1,2,3-benzotriazines
- from Like Ring Skeletons 709
- Ring-Transformation Reactions 187, 709

● 1,2,4-Benzotriazine



- 1,2,4-Benzotriazines
- Ring Synthesis 421
- 2,3,5,6,7,8-Hexahydro-1,2,4-benzotriazines
- Ring Synthesis 794

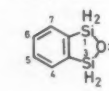
● 1,2,4-Benzoxadiazine



2*H*- 4*H*-

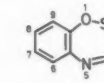
- Ring Synthesis 134 (4316)

● 2,1,3-Benzoxadisilole



- Ring Synthesis 199 (4333)

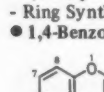
● 1,2,5-Benzoxathiazepine



3*H*-

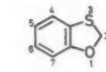
- 4,5-Dihydro-3*H*-1,2,5-benzoxathiazepines
- Ring Synthesis 220

● 1,4-Benzoxathiin



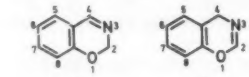
- 1,4-Benzoxathiins
- from Like Ring Skeletons 451
- 2,3-Dihydro-1,4-benzoxathiins
- Ring Synthesis 451

● 1,3-Benzoxathiole



- Ring Synthesis 660

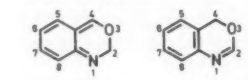
● 1,3-Benzoxazine



2*H*- 4*H*-

- Ring Synthesis 35

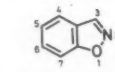
● 3,1-Benzoxazine



2*H*- 4*H*-

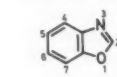
- 3,1-Benzoxazines
- Ring Synthesis 36
- Octahydro-3,1-benzoxazines
- Ring Synthesis 36

● 1,2-Benzoxazole



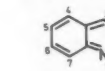
- 1,2-Benzoxazoles
- Ring-Transformation Reactions 30
- 1,2-Benzoxazolium Salts
- Ring Transformation Reactions 35
- 2,3-Dihydro-1,2-benzoxazoles
- Ring Synthesis 208
- Ring Transformation Reactions 30
- Octahydro-1,2-benzoxazoles
- Ring Synthesis 210

● 1,3-Benzoxazole



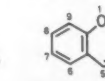
- 1,3-Benzoxazoles
- Ring Synthesis 30, 438
- 2,3-Dihydro-1,3-benzoxazoles
- Ring Synthesis 30

● 2,1-Benzoxazole



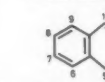
- 2,1-Benzoxazoles
- Ring Transformation Reactions 23
- 2,1-Benzoxazolium Salts
- Ring Transformation Reactions 37
- 4,5,6,7-Tetrahydro-2,1-benzoxazoles
- Ring Transformation Reactions 28

● 1-Benzoxepin



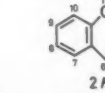
- 2,3,4,5-Tetrahydro-1-benzoxepins
- from Like Ring Skeletons 129 (4296)

● 3-Benzoxepin



- Ring Synthesis 769

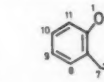
● 1-Benzoxocin



2*H*-

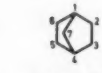
- 3,4,5,6,7,8-Hexahydro-2*H*-1-benzoxocins
- Ring Synthesis 54

● 1-Benzoxonin



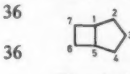
- 2,3,4,5,6,7-Hexahydro-1-benzoxonins
- Ring Synthesis 54

● Bicyclo[2.2.1]heptane



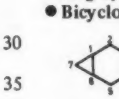
- Bicyclo[2.2.1]heptanes (Norbornanes)
- Ring-Cleavage Reactions 429
- Bicyclo[2.2.1]heptenes (Norbornenes)
- Annelation Reactions 636
- Bicyclo[2.2.1]heptadienes (Norbornadienes)
- Annelation Reactions 173, 636
- Ring-Transformation Reactions 428

● Bicyclo[3.2.0]heptane



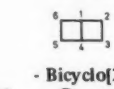
- Bicyclo[3.2.0]hept-2-enes
- Ring Synthesis 350
- Bicyclo[3.2.0]hept-6-enes
- Ring Synthesis 349

● Bicyclo[4.1.0]heptane



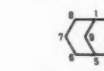
- Bicyclo[4.1.0]heptanes
- Ring Synthesis 350
- Ring-Transformation Reactions 69
- Bicyclo[4.1.0]hept-3-enes
- Ring-Transformation Reactions 348

● Bicyclo[2.2.0]hexane



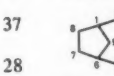
- Bicyclo[2.2.0]hexa-2,5-dienes (Dewar Benzenes)
- Ring Synthesis 352
- Annelation Reactions 636

● Bicyclo[3.3.1]nonane



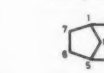
- Ring Synthesis 12, 428

● Bicyclo[4.2.1]nonane



- Ring Synthesis 624

● Bicyclo[3.2.1]octane

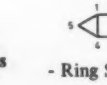


- Ring Synthesis 12

● Bicyclo[5.1.0]octane

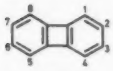
- Bicyclo[5.1.0]octanes
- Ring-Transformation Reactions 69
- Bicyclo[5.1.0]octa-2,4-dienes
- Ring Synthesis 348

● Bicyclo[2.1.0]pentane



- Ring Synthesis 350

- Ring-Transformation Reactions 350
● Biphenylene



- Annelation Reactions 431
● 1,8-Bishomocubanes

- Ring-Transformation Reactions 353
● Boranates
- Synthesis 669
- Reactions 376, 409 (4440), 412 (4452), 472 (4463), 614 (4536), 669, 746 (4587)
● Boranes
- 1-Alkenylboranes and Derivatives
- Reactions 342 (4417)
- Trialkylboranes
- Reactions 317, 376, 411 (4448), 541 (4505)
● Borinic Acid Esters
- Reactions 285 (4376)
● Boronic Acid Esters
- Alkane-1,1,1-triboronic Acid Esters
- Synthesis and Reactions 147
- 1-Alkeneboronic Acid Esters
- Synthesis 152, 153
- *gem*-Diboronic Acid Esters
- Synthesis 148, 150
- 1-Haloalkaneboronic Acid Esters
- Reactions 679 (4554)
- Methanetetraboronic Acid Esters
- Synthesis and Reactions 147
● Boronic Acids
- 1-Alkeneboronic Acids
- Synthesis 151
- Reactions 683 (4566)
● *C*-Bromo Compounds
- General
- Reactions 476 (4477)
- Bromoalkanes
- from Like Carbon Skeletons 105, 408 (4439), 430, 540 (4500)
- from Unlike Carbon Skeletons 677 (4545)
- Reactions 742 (4573)
- Bromoalkenes Type C=C–Br
- from Like Carbon Skeletons 629, 708, 809 (4596)
- Reactions 434, 811 (4603)
- Bromoalkenes Type C=C–C–Br
- Reactions 742 (4574)
- Bromoalkynes Type C≡C–C–Br
- from Like Carbon Skeletons 255, 390
- α-Bromocarboxylic Acid Derivatives
- from Like Carbon Skeletons 96
- *vic*-Dibromoalkanes
- Reactions 398, 678 (4548)
- 1,1-Dibromo-1-alkenes
- from Unlike Carbon Skeletons 677 (4547)
- α,α-Dibromocarbonyl Compounds
- from Like Carbon Skeletons 455
- Non-Aromatic Heterocyclic *C*-Bromo Compounds
- from Unlike Carbon Skeletons 333
- Reactions 61 (2460)
- Miscellaneous Types
- Synthesis 157, 683 (4566)
● *N*-Bromo Compounds
- *N*-Bromocarbamates
- Synthesis 541 (4503)
- *N*- Bromocarboxamides
- Synthesis 541 (4503)
● Carbamic Acid Esters
- Alkyl Carbamates
- Synthesis 65 (4281), 313, 378, 591
- Aryl Carbamates
- Synthesis 309
- *N*-Sulfonylcarbamic Acid Esters
- Reactions 65 (4279)
● Carbamimidic Acid Esters
- Synthesis 287 (4382)
● Carbamimidic Halides
- Reactions 343 (4422)
● Carbamimidothioic Acid Esters
- Synthesis 55, 285 (4375), 332
- Reactions without Cyclization 285 (4375)
● Carbamothioic Acid Esters
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● Carbenes
- Alkoxycarbonylcarbenes
- Reactions 173
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● Carbodiimides
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● Carbonic Acid Esters
- Alkyl Aryl Carbonates
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● Carbonimidic Dihalides
- Synthesis 484
- Reactions 345 (4429)
● Carbonimidodithioic Acid Esters
- Reactions 332
● Carbonimidothioic Halides
- Reactions 48
● Carbonochloridic Acid Esters
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- Synthesis 341 (4414)
- Reactions 724
● Carbonofluoridic Acid Esters
- Synthesis 598, 801
● Carboperoxoic Acid Esters
- Synthesis and Reactions 744 (4578)
● Carboximidic Acid Esters
- General
- Reactions 65 (4282)
- *N*-(1-Alkenyl)-carboximidates
- Synthesis 289 (4394)
- Alkyl and Aryl *N*-Cyanocarboximidates
- Reactions 202 (4344)
- Alkyl Formimidates
- Synthesis 272
● Carboximidic Halides
- Reactions 645
● Carboximidothioic Acid Esters
- Synthesis 48, 121
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● Carboxylic Acid Amides
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- from Like Carbon Skeletons 341 (4414), 359, 412 (4453), 715
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- Reactions without Cyclization 412 (4453), 625
- *N*-Alkylidenecarboxamides
- Synthesis 272
- Cyclization Reactions 57
- Reactions without Cyclization 197 (4324)
- *N*-Monosubstituted Carboxamides
- from Like Carbon Skeletons 683 (4567)
- Miscellaneous Types
- Synthesis 197 (4324)
● Carboxylic Acid Anhydrides
- Synthesis 341 (4414)
- Reactions 613 (4534)
● Carboxylic Acid Chlorides, General
- Reactions 477 (4482), 613 (4534)
● Carboxylic Acid Esters
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- from Like Carbon Skeletons 412 (4453)
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- Cyclization Reactions 414 (4459)
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- from Like Carbon Skeletons 456, 723
- Reactions without Cyclization 285 (4373), 622, 683 (4565), 743 (4577)
- 2-Haloalkyl Esters
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● Carboxylic Acid Fluorides
- General
- Synthesis 281 (4355), 801
- 2-Alkenoyl Fluorides
- from Unlike Carbon Skeletons 123
● Carboxylic Acid Hydrazides
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- Synthesis 64 (4277), 163
- Cyclization Reactions 200 (4337)
- Reactions without Cyclization 544 (4515)
● Carboxylic Acid Imides
- Synthesis 686
- Reactions 685
● Carboxylic Acids, General
- from Like Carbon Skeletons 544 (4515)
- from Unlike Carbon Skeletons 544 (4514)
- Cyclization Reactions 411 (4450)
- Reactions without Cyclization 412 (4453), 613 (4534), 477 (4479)
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Cepham

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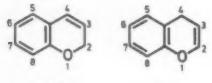
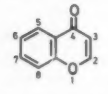
- Cyclization Reactions 338 (4404)
● *C*-Chloro Compounds
- General
- Reactions 476 (4477)
- Chloroalkanes
- from Like Carbon Skeletons 408 (4439), 430, 540 (4500), 744 (4578)
- Reactions 316, 742 (4573)
- Chloroalkenes Type C=C–Cl
- from Like Carbon Skeletons 189, 708
- from Unlike Carbon Skeletons 659
- Reactions 434, 811 (4603)
- Chloroalkenes Type C=C–C–Cl
- Reactions 742 (4573)
- Chloroalkenes Type C=C–C–C–Cl
- from Like Carbon Skeletons 393
- Chloroalkynes Type C≡C–Cl
- from Like Carbon Skeletons 458
- Chloroalkynes Type C≡C–C–Cl
- from Like Carbon Skeletons 390
- Chloroarenes
- from Unlike Carbon Skeletons 383
- α-Chloro-β-dicarbonyl Compounds
- from Like Carbon Skeletons 667
- Chloroheteroarenes
- from Unlike Carbon Skeletons 383
- *gem*-Dichloroalkanes
- from Like Carbon Skeletons 448
- Reactions 63 (4269)
- *vic*-Dichloroalkanes
- from Like Carbon Skeletons 678 (4549)
- 1,1-Dichloro-1-alkenes
- from Unlike Carbon Skeletons 458, 535, 631
- Dichloroalkenes Type –CCl=CCl–
- from Like Carbon Skeletons 678 (4549)
- α,α-Dichlorocarbonyl Compounds

- from Like Carbon Skeletons 455
- from Unlike Carbon Skeletons 734
- **Non-Aromatic Heterocyclic *C*-Chloro Compounds**
- Synthesis 333, 484
- **Polychloro Compounds**
- from Unlike Carbon Skeletons 383
- Reactions 631
- **1,1,1-Trichloro Compounds**
- from Unlike Carbon Skeletons 448, 484, 608
- Reactions 480 (4489), 484
- **1,1,2-Trichloroalkanes**
- from Like Carbon Skeletons 527
- ● ***N*-Chloro Compounds**
- ***N,N*-Dichloro Compounds, General**
- Reactions 684 (4568)
- ***N*-Chloroamidines**
- Reactions 287 (4382)
- ***N*-Chlorocarbamates**
- Synthesis 541 (4503)
- ***N*-Chlorocarboxamides**
- Synthesis 541 (4503)
- ***N*-Chlorophosphoramidic Acid Derivatives**
- Synthesis 712
- **Chloroureas**
- Synthesis and Reactions 62 (4266)
- ***N,N*-Dichlorocarbamates**
- Synthesis 504
- Reactions 503
- ***N,N*-Dichlorosulfamides**
- Synthesis 504
- Reactions 503
- ***N,N*-Dichlorosulfonamides**
- Reactions 503
- ● **Cholic Acids and Relatives**
- Reactions 330
- ● **Chromene**

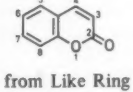


2*H*- 4*H*-

- **Chromans**
- from Like Ring Skeletons 282 (4360)
- Ring Synthesis 392
- **6,7,8,8a-Tetrahydro-5*H*-chromenes**
- Ring Synthesis 131 (4303)
- Ring-Transformation Reactions 131 (4303)
- ● **Chromones**



- Reactions with Retention of the Ring Skeleton 284 (4369)
- ● **Coumarins**



- from Like Ring Skeletons 284 (4369)
- Ring Synthesis 599, 612 (4529), 740
- Reactions with Retention of the Ring Skeleton 282 (4360)
- ● **Cubanes**

- Ring-Transformation Reactions 352
- ● **Cyanamides**

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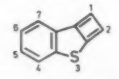
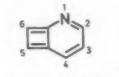
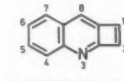
- Reactions 111, 332
- ● **Cyanines**
- **Cationic Cyanines**
- Synthesis 132 (4309)
- Reactions 132 (4309), 282 (4359), 431
- ● **Cycloalkanecarboxylic Acids**
- from Unlike Carbon Skeletons 286 (4378) (4380)
- ● **Cyclobuta[*b*][1]benzothiophene**



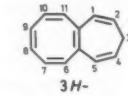
- **2a,7b-Dihydrocyclobuta[*b*][1]benzothiophenes**
- Ring Synthesis 350
- ● **Cyclobutanes**
- **Cyclobutanediones and Derivatives**
- Ring Synthesis 63 (4273), 260, 298
- **Cyclobutanones and Derivatives**
- Ring Synthesis 542 (4508)
- **Functionally Substituted Cyclobutanes**
- Ring Synthesis 260, 542 (4508)
- Reactions with Retention of the Ring Skeleton 263
- Ring-Cleavage Reactions 3, 663
- ● **Cyclobuta[*b*]pyridine**



- **1,2,4a,5,6,6a-Hexahydrocyclobuta[*b*]pyridines**
- Ring Synthesis 585
- ● **Cyclobuta[*b*]quinoline**

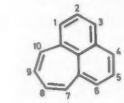


- **1,2-Dihydrocyclobuta[*b*]quinolines**
- Ring Synthesis 34
- ● **Cyclobutenes**
- **Cyclobutenediones and Derivatives**
- from Like Ring Skeletons 263, 639
- Ring-Cleavage Reactions 263
- Ring-Transformation Reactions 641
- **Cyclobutene Hydrocarbons**
- Annellation Reactions 350
- **Functionally Substituted Cyclobutenes**
- from Like Ring Skeletons 263
- Ring Synthesis 631
- Ring-Cleavage Reactions 263, 411 (4451)
- ● **Cyclodecadienes**
- **1,2-Cyclodecadienes**
- Ring Synthesis 194
- ● **Cyclodecanes**
- Ring Synthesis 159
- ● **Cyclodecenes**
- from Like Ring Skeletons 194
- ● **Cycloheptacyclooctene**

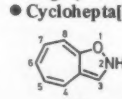


3*H*-

- Ring Synthesis 769
- ● **Cycloheptadienes**
- **1,3-Cycloheptadienes**
- Ring Synthesis 348
- ● **Cyclohepta[*de*]naphthalene**

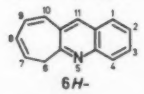


- Ring Synthesis 349
- ● **Cycloheptanes**
- **Cycloheptanones and Derivatives**
- Ring Synthesis 743 (4575)
- ● **Cyclohepta[*d*]-1,2-oxazole**



2*H*-

- **3,3a,6,7,8,8a-Hexahydro-2*H*-cyclohepta[*d*]-1,2-oxazoles**
- Ring Synthesis 210
- ● **Cyclohepta[*b*]quinoline**



6*H*-

- **7,8,9,10-Tetrahydro-6*H*-cyclohepta[*b*]-quinolines**
- Ring Synthesis 34
- ● **Cycloheptatrienes**
- **Cycloheptatriene Hydrocarbons**
- Ring Synthesis 197 (4325), 444
- **Cycloheptatrienones (Tropones)**
- from Like Ring Skeletons 189
- ● **Cyclohexadienes**
- **1,3-Cyclohexadienes**
- Ring Synthesis 409 (4441)
- **Cyclohexadienones**
- Ring Synthesis 486
- ● **Cyclohexanes**
- **Cyclohexanediones and Derivatives**
- Reactions with Retention of the Ring Skeleton 339 (4405), 474 (4470)
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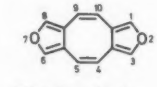
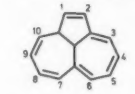
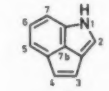
- **Cyclohexanones and Derivatives**
- from Like Ring Skeletons 408 (4438), 744 (4579)
- Ring Synthesis 429
- Annelation Reactions 497, 611 (4525)
- **Miscellaneous Types**
- Ring-Transformation Reactions 159
- ● **Cyclohexenes**
- **Cyclohexene Hydrocarbons**
- Annelation Reactions 348
- Ring-Transformation Reactions 347
- **Cyclohexenones and Derivatives**
- Reactions with Retention of the Ring Skeleton 408 (4438), 744 (4579)
- **Functionally Substituted Cyclohexenes**
- from Like Ring Skeletons 408 (4438)
- ● **Cyclononadienes**
- **1,2-Cyclononadienes**
- Ring Synthesis 194
- ● **Cyclononanes**
- Ring Synthesis 3
- ● **Cyclononenes**
- from Like Ring Skeletons 194
- ● **Cycloocta[1,2-*c*;5,6-*c*']difuran**



- Ring Synthesis 770
- ● **Cyclooctatetraenes**
- Ring-Transformation Reactions 399
- ● **Cyclopentadiene**
- **Cyclopentadienones**
- Ring-Transformation Reactions 486
- ● **Cyclopenta[*ef*]heptalene**



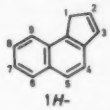
- Ring Synthesis 282 (4359)
- ● **Cyclopenta[*cd*]indole**



1*H*-

- **2,2a,3,4,4a,5,7a,7b-Octahydro-1*H*-cyclopenta[*cd*]indoles**
- Ring Synthesis 141
- ● **Cyclopentanes**
- **General**

- Ring Synthesis 1
- **Cyclopentanones and Derivatives**
- Reactions with Retention of the Ring Skeleton 408 (4436)
- **Functionally Substituted Cyclopentanes**
- Ring Synthesis 299
- **Cyclopenta[*a*]naphthalene**



1*H*-

- **2,3,3a,4,5,9b-Hexahydro-1*H*-cyclopenta[a]naphthalenes**
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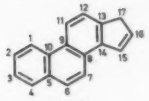
2*H*-

- **Hexahydrocyclopenta[*c*][1,2]oxazoles**
- Ring Synthesis 211
- **Cyclopenta[*a*]phenanthrene**



17*H*-

- **1,2,3,4,5,10-Hexahydrogonanes**
- Ring Synthesis 11
- **Cyclopentapyrazole**

- **1,4,5,6-Tetrahydrocyclopentapyrazoles**
- Ring Synthesis 48
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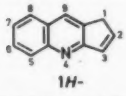
- **1,4,5,6-Tetrahydrocyclopenta[*b*]pyrroles**
- Ring Synthesis 344 (4427)
- **Cyclopenta[*b*]quinoline**



1*H*-

- **2,3-Dihydro-1*H*-cyclopenta[*b*]quinolines**
- Ring Synthesis 34
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- **Cyclopentene Hydrocarbons**
- Ring Synthesis 350
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1*H*-

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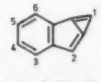
- Ring-Transformation Reactions 351
- **Cyclopropa[*b*]indene**



- **1,1a,2,6b-Cyclopropa[*b*]indenes**
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- **General**
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- **Cyclopropanones and Derivatives**
- Ring Synthesis 542 (4508)
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- Ring-Transformation Reactions 491
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- **1,3-Diazabicyclo[3.1.0]hex-3-enes**
- Ring Synthesis 485, 494
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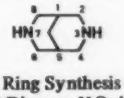

- Ring Synthesis 134 (4319)
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- **Alkylthio- and Arylthiodiazenes**
- Synthesis 199 (4332)
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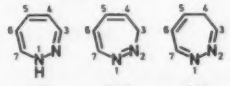

1*H*- 3*H*- 4*H*-

- **1*H*-1,2-Diazepines**
- from Like Ring Skeletons 603
- **4*H*-1,2-Diazepines**
- Reactions with Retention of the Ring Skeleton 603
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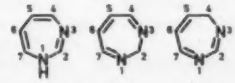
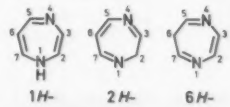


1*H*- 2*H*- 4*H*-

- **4*H*-1,3-Diazepines**
- Ring Synthesis 487
- **1,4-Diazepine**



1*H*- 2*H*- 6*H*-

- **6*H*-1,4-Diazepines**
- Ring Synthesis 487
- **6,7-Dihydro-1*H*-1,4-diazepines**
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- **1,3-Diazetidines**
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- *S*–*N* Coupling Reactions 199 (4332)
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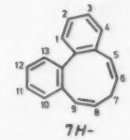
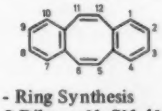
- **Dibenzo[*a*,*c*]cyclononene**

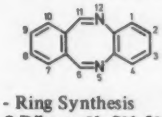


7*H*-

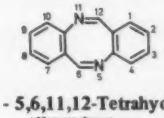
- Ring Synthesis 771
- **Dibenzo[*a*,*e*]cyclooctene**



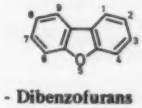
- Ring Synthesis 770
- **Dibenzo[*b*,*f*][1,4]diazocine**



- Ring Synthesis 246
- **Dibenzo[*b*,*f*][1,5]-diazocine**



- **5,6,11,12-Tetrahydrodibenzo[*b*,*f*][1,5]-diazocines**
- Ring Synthesis 37
- **Dibenzofuran**



- **Dibenzofurans**
- Ring Synthesis 533
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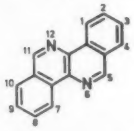
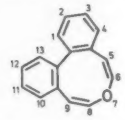
● **Dibenzo[*c,h*][1,5]naphthyridine**



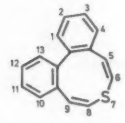
- **5,11-Dihydrodibenzo[*c,h*][1,5]naphthyridines**
- Ring Synthesis 494

● **Dibenzo[*d,f*]oxonin**



- Ring Synthesis 771

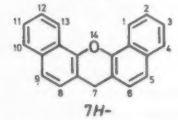
● **Dibenzo[*d,f*]thionin**



- Ring Synthesis 771

● **Dibenzothiophene**
- Ring Synthesis 533

● **Dibenzo[*c,h*]xanthene**



7H-

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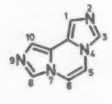
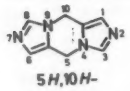
- from Unlike Carbon Skeletons 263, 411 (4451)
- Cyclization Reactions 132 (4310)

● **Diimidazo[1,5-*a*:5',1'-*c*]pyrazine**



- **1,10,10a-10b-Tetrahydroimidazo[1,5-*a*:5',1'-*c*]pyrazines**
- Ring Synthesis 731

● **Diimidazo[3,4-*a*;3',4'-*d*]pyrazine**



5H,10H-

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- Ring Synthesis 305
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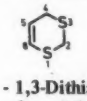

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- 1,2-Dithioles
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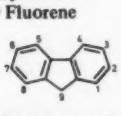

- Reactions with Retention of the Ring Skeleton 716

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- *gem*-Difluoroalkanes
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4*H*,6*H*-

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4*H*-

- 2,6-Dihydro-4*H*-furo[3,4-*c*]pyrazoles
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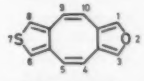
- 2,4,5,6-Tetrahydrofuro[3,2-*b*]pyridines
- Ring Synthesis 32

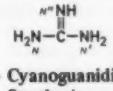
● Furo[3,4-*a*]thieno[3,4-*e*]cyclooctene



- Ring Synthesis 770

● Glycosides
- Synthesis 804

● Guanidine and Derivatives



- Cyanoguanidines
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- Cyclization Reactions 132 (4307)
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- Synthesis 523
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● Heteroaromatic *N*-Oxides
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● Heterocyclic Carboxylic Acid Chlorides
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- *S*-Heterocyclic Carboxylic Acid Esters
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● Heterocyclic Carboxylic Acids
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● Heterocyclic Nitriles
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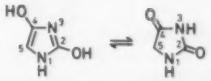

- from Like Ring Skeletons 338 (4403)
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● Hydrazines
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- Synthesis 138, 203 (4350)
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- Synthesis 684 (4570)
- ***O*-Sulfonylhydroxylamines**
- Synthesis 788
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- Synthesis 714, 788
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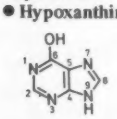
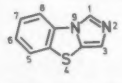
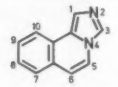


- Ring Synthesis 265
● **Imidazo[5,1-*b*][1,3]benzothiazole**



- **Imidazo[5,1-*b*][1,3]benzothiazonium Salts**
- Ring Synthesis 511
● **Imidazo[5,1-*a*]isoquinoline**



- **1,10b-Dihydroimidazo[5,1-*a*]isoquinolines**
- Ring Synthesis 731
● **Imidazole**

- **Imidazolines**
- from Like Ring Skeletons 293, 339 (4406)
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- Ring Synthesis 292, 294, 344 (4424)
- **4,5-Dihydroimidazolium Salts**
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● **Imidazo[1,2-*b*]pyridazine**

- Annelation Reactions 175
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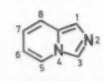
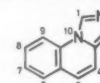
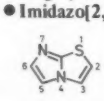


- **1,8a-Dihydroimidazo[1,5-*a*]pyridines**
- Ring Synthesis 731
● **Imidazo[1,5-*a*]quinoline**



- **3,3a-Dihydroimidazo[1,5-*a*]quinolines**
- Ring Synthesis 731
● **Imidazo[2,1-*b*][1,3]thiazole**



- Ring Synthesis 29
● **Imides**
see: Dicarboxylic Acid Imides, Disulfonic Acid Imides, etc.
● **Imines**
- **General**
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- Synthesis 380
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- Synthesis 339 (4407), 343 (4423), 704
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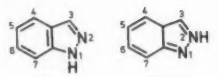
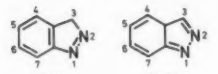
- Cyclization Reactions 647
● **Iminosulfur Dihalides**
- Synthesis 801
● **Imino Ylids**
- Synthesis 345 (4429)
● **Indazole**



1*H*- 2*H*-



3*H*- 3a*H*-

- **2*H*-Indazoles**
- Ring Synthesis 28
- **3a*H*-Indazoles**
- Ring Synthesis 289 (4392)
- **3a,7a-Dihydro-1*H*-indazoles**
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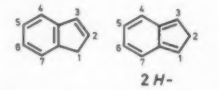
- **4,5,6,7-Tetrahydro-1*H*-indazoles**
- Ring Synthesis 48
- **4,5,6,7-Tetrahydro-2*H*-indazoles**
- Annelation Reactions 35
- **2,3,4,5,6,7-Hexahydro-1*H*-indazoles**
- Ring Synthesis 28
● **Indene**



2*H*-

- **Indenes**
- from Like Ring Skeletons 59 (4253), 60 (4255)
- Ring Synthesis 283 (4364), 337 (4399), 383, 585
- Annelation Reactions 210
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- Ring Synthesis 14
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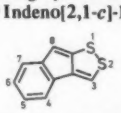
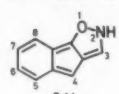
- Ring Synthesis 742 (4574)
- **Octahydroindenes**
- Ring Synthesis 10
● **Indeno[2,1-*c*]-1,2-dithiole**

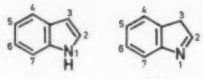


- Ring Synthesis 133 (4311)
● **Indeno[2,1-*d*]-1,2-oxazole**



2*H*-

- **3,3a,4,8b-Tetrahydro-2*H*-indeno[2,1-*d*]-1,2-oxazoles**
- Ring Synthesis 210
● **Indole**



3*H*-

- **Indoles**
- from Like Ring Skeletons 131 (4306), 199 (4334), 334, 732
- Ring Synthesis 26, 66 (4288), 133 (4312), 798
- **2,3-Dihydroindoles**
- from Like Ring Skeletons 472 (4465)
- Ring Synthesis 131 (4306), 132 (4308), 199 (4334), 201 (4341), 214
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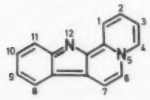
- Ring Synthesis 344 (4427), 492
- **2,3,3a,4,5,6-Hexahydroindoles**
- Ring Synthesis 497

● **Indolo[2,3-*a*]quinolizine**



- **1,2,6,7,12,12b-Hexahydroindolo[2,3-*a*] quinolizines**
- Ring Synthesis 627
- **1,2,3,4,6,7,12,12b-Octahydroindolo-[2,3-*a*]quinolizines**
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- ***gem*-Diiodoalkanes**
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- from Like Carbon Skeletons 430
- **Iodoalkenes Type C=C–J**
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- **α-Iodocarboxylic Acid Derivatives**
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- **Acyl Isocyanates**
- Reactions without Cyclization 286 (4377), 748 (4594)
- **Alkoxycarbonyl Isocyanates**
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- **Alkyl Isocyanates**
- Synthesis 399, 545 (4519), 592
- Cyclization Reactions 463
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- **Aryl Isocyanates**
- Cyclization Reactions 33, 53, 649
- Reactions without Cyclization 649
- **Chlorosulfonyl Isocyanate**
- Cyclization Reactions 414 (4459)
- **Halocarbonyl Isocyanates**
- Cyclization Reactions 645
- **Silyl Isocyanates**
- Reactions without Cyclization 748 (4594)
- **Sulfonyl Isocyanates**
- Synthesis 65 (4279)
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- **General**
- Cyclization Reactions 291
- Reactions without Cyclization 480 (4490)
- **1-Alkenyl Isocyanides**
- Synthesis 61 (4263)
- **Alkyl Isocyanides**
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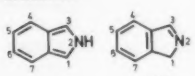
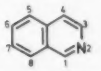
- **α-Isocyanocarboxylic Acid Derivatives**
- Cyclization Reactions 200 (4336), 346 (4433), 609
- Reactions without Cyclization 610
- **Miscellaneous Types**
- Reactions 130 (4300)
● **Isoindole**



1*H*-

- **Isoindoles**
- Ring Synthesis 246, 252
- **1,3-Dihydroisoindoles**
- Ring Synthesis 132 (4308), 252, 797
- **4,5,6,7-Tetrahydroisoindoles**
- Ring Synthesis 492
● **Isoquinoline**



- **Isoquinolines**
- from Like Ring Skeletons 733
- Ring Synthesis 33, 482 (4499), 487
- Annelation Reactions 731
- Reactions with Retention of the Ring Skeleton 342 (4417), 650
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- from Like Ring Skeletons 342 (4418)
- **3,4-Dihydroisoquinolines**
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- Synthesis and Reactions 785
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- **General**
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- **Alkoxycarbonyl Isothiocyanates**
- Synthesis 302
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- **Aminothiocarbonyl Isothiocyanates**
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- **Aryl Isothiocyanates**
- Cyclization Reactions 217, 219
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- **Aryloxycarbonyl Isothiocyanates**
- Synthesis 303
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- **1-Haloalkyl Isothiocyanates**
- Synthesis 675
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- **Silyl Isothiocyanates**
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- Synthesis 379
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- **Ketene *O,N*-Acetals**
- Reactions 201 (4343)
- **Ketene *O,O*-Acetals**
- Synthesis and Reactions 734
- **Ketene *S,S*-Acetals**
- Synthesis 681 (4558)
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- **Ketene Imines**
- Synthesis 65 (4280)
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- **Ketene *S*-Semiacetal Halides**
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- **General**
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- **Dihaloketenes**
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- **Ketene and Homologs**
- Cyclization Reactions 214, 538
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- from Heterocyclic Compounds 26, 615 (4539), 681 (4558)
- from Like Carbon Skeletons 338 (4401), 543 (4511), 615 (4539), 814 (4612)
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- **2-Alkenyl Ketones**
- from Unlike Carbon Skeletons 63 (4268), 268, 477 (4482), 542 (4509)
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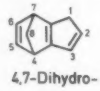

4,7-Dihydro-

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- - Synthesis 202 (4347)
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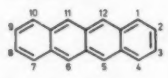
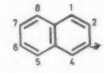


- Ring Synthesis 425
- **● Naphthalene**



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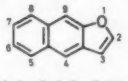
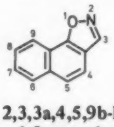
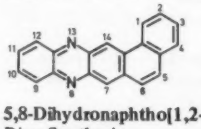


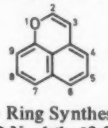
- **4,4a,5,6,8a,9-Hexahydronaphtho[2,3-*b*]furans**
- from Like Ring Skeletons 624
- **● Naphtho[2,1-*d*]-1,2-oxazole**



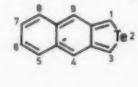
- **2,3,3a,4,5,9b-Hexahydronaphtho[2,1-*d*]-1,2-oxazoles**
- Ring Synthesis 210
- **● Naphtho[1,2-*b*]phenazine**



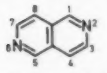
- **5,8-Dihydronaphtho[1,2-*b*]phenazines**
- Ring Synthesis 61 (4262)
- **● Naphtho[1,8-*bc*]pyran**



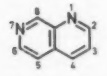
- Ring Synthesis 796
- **● Naphtho[2,3-*c*]tellurophene**



- 4,9-Dihydronaphtho[2,3-*c*]tellurophenes
- Ring Synthesis 265
● 2,6-Naphthyridine



- Ring Synthesis 414 (4462)
● 1,7-Naphthyridine



- Ring Synthesis 414 (4462)
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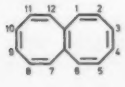

- Ring Synthesis 769
● Organoaluminum Compounds
- 1-Alkenylalanes
- Synthesis and Reactions 632
- 1-Alkynylalanes
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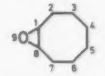
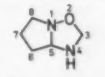
- Ring-Cleavage Reactions 579
● 9-Oxa-8-azatricyclo[3.2.1.$1^{3,8}$]nonane

- Ring Synthesis 212
● 9-Oxabicyclo[6.1.0]nonane



- Ring-Transformation Reactions 603
● 2-Oxa-4,7-diazabicyclo[3.2.0]heptane

- 2-Oxa-4,7-diazabicyclo[3.2.0]-3-heptenes
- Ring-Cleavage Reactions 344 (4426)
● 2-Oxa-1,4-diazabicyclo[3.3.0]octane



- Ring Synthesis 217
● 1,3,5-Oxadiazine

2*H*-

- 2*H*-1,3,5-Oxadiazines
- Ring Synthesis 523
- 1,3,5-Oxadiazinium Salts
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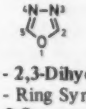
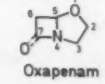
- 1,2,4-Oxadiazoles
- Ring Synthesis 31
- Tetrahydro-1,2,4-oxadiazoles
- Ring Synthesis 215
● 1,2,5-Oxadiazole
see: Furazan
● 1,3,4-Oxadiazole

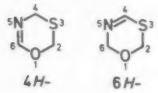


- 2,3-Dihydro-1,3,4-oxadiazoles
- Ring Synthesis 133 (4313)
● Oxapenams and Derivatives



Oxapenam

- Reactions 579
● 1,3,5-Oxathiazine



4H- 6H-

- Ring Synthesis 789
● 1,4,2-Oxathiazole

- Dihydro-1,4,2-oxathiazoles
- Ring Synthesis 219
● 1,3-Oxathiole

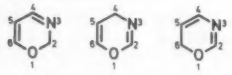
- 1,3-Oxathiolanes
- Ring Synthesis 66 (4285)
● 1,2,5-Oxazaphosphole

- 1,2,5-Oxazaphospholanes
- Ring Synthesis 220
● 1,4,2-Oxazaphosphole

- 2,3-Dihydro-P^V-1,4,2-oxazaphospholes
- Ring-Transformation Reactions 731
● 1,3-Oxazepine

- 2,5-6,7-Tetrahydro-1,3-oxazepines
- Ring Synthesis 489
● 1,4-Oxazepine

- 6,7-Dihydro-1,4-oxazepines
- Ring Synthesis 489
- 2,3,4,7-Tetrahydro-1,4-oxazepines
- Ring Synthesis 578
● 1,3-Oxazine



2H- 4H- 6H-

- 6H-1,3-Oxazines
- Ring Synthesis 201 (4343)
- Ring-Transformation Reactions 66 (4289), 201 (4343)
- 5,6-Dihydro-4H-1,3-oxazines
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- Ring-Cleavage Reactions 545 (4519)
- Tetrahydro-1,3-oxazines
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- Ring Synthesis 203 (4350)
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- Ring Transformation Reactions 20
- 1,2-Oxazolium Salts
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- Ring Transformation Reactions 20
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- Ring-Transformation Reactions 816 (4618)
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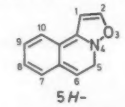
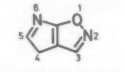
- Tetrahydro-1,3-oxazoles
- Ring Synthesis 65 (4284), 724
- Ring-Cleavage Reactions 42
● [1,2]Oxazolo[3,2-*a*]isoquinoline

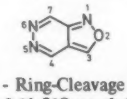


5H-

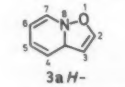
- 6,10b-Dihydro-5*H*-[1,2]oxazolo[3,2-*a*]isoquinolines
- Ring Synthesis 206
● [1,3]Oxazolo[5,4-*d*][1,2]oxazole



- Hexahydro-[1,3]oxazolo[5,4-*d*][1,2]oxazoles
- Ring Synthesis 210
● [1,2]-Oxazolo[3,4-*d*]pyridazine

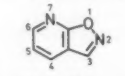


- Ring-Cleavage Reactions 35
● [1,2]Oxazolo[2,3-*a*]pyridine

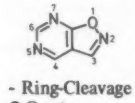


3a H-

- 4,5,6,7-Tetrahydro[1,2]oxazolo[2,3-*a*]-pyridinium Salts
- Ring Transformation Reactions 26
● 1,2-Oxazolo[5,4-*b*]pyridine



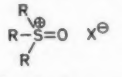
- Ring-Cleavage Reactions 32
● 1,2-Oxazolo[5,4-*d*]pyrimidine



- Ring-Cleavage Reactions 35
● Oxete

- Oxetanes
- Ring-Cleavage Reactions 86
● Oxime Derivatives
- *O*-Alkyl- and *O*-Aryloximes
- Synthesis 413 (4456), 542 (4507), 782
- Reactions 139, 413 (4456)
● Oximes
- Aldoximes
- Synthesis 810 (4598)
- Cyclization Reactions 200 (4338)
- Reactions without Cyclization 138, 401, 502, 542 (4507)
- *vic*-Dioximes
- Cyclization Reactions 200 (4338)
- α-Hydroxy-oximes and *O*-Derivatives
- Synthesis 792
- Ketoximes
- Synthesis 792
- Cyclization Reactions 465
- Reactions without Cyclization 343 (4422), 665, 782
- Regeneration of the Ketone 410 (4446)
- α-Oxo-oximes
- Synthesis 792
● Oxirene

- Oxiranes
- Ring Synthesis 481 (4496), 497, 545 (4520)
- Ring-Cleavage Reactions 88, 256, 612 (4528), 619
- Ring-Transformation Reactions 71, 482 (4497)
● Oxosulfonium Salts

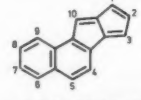


- Synthesis 287 (4385)
● Penams, Penicillins, and Relatives

Penam

- Synthesis 548
- Reactions 547
● Pentalene

- Octahydropentalenes
- Ring Synthesis 11, 603
● Pentaleno[2,1-*a*]naphthalene

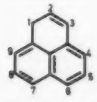


- 1,2,3,3a,10,10a-Hexahydropentaleno-[2,1-*a*]naphthalenes
- Ring Synthesis 11
● Peptides
- General
- *Carboxy- and N-Protected Peptides*
- - Reactions 616 (4544)
- *Peptides and Derivatives containing α,β-Unsaturated α-Amino-Acids*
- - Reactions 402
- *N-Protected Peptides*
- - Synthesis 290 (4396)
- Oligopeptides, General
- - Synthesis 594
● Peroxy Compounds

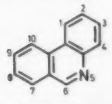
see also: Carboperoxoic Acids, Carboperoxoic Acid Esters, Diacyl Peroxides, Hydroperoxy Compounds, Peroxylactones, etc.

- Cyclic Peroxides
- Synthesis 125, 159, 275, 388

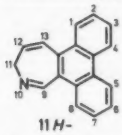
- Reactions 159, 275
- **Dialkyl Peroxides**
- Synthesis 42
- **Endoperoxy Compounds**
- Synthesis 783
- **● Phanes**
- **[2.2]Cyclophanes**
- Synthesis 807
- **Hetera[3.3]cyclophanes**
- Synthesis 807
- **Miscellaneous Types**
- Synthesis 777
- **● Phenalene**



- Ring-Transformation Reactions 349
- **● Phenanthridine**

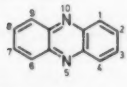


- **5,6-Dihydrophenanthridines**
- Ring-Synthesis 709
- **● Phenanthro[9,10-c]azepine**



11*H*-

- Ring Synthesis 486
- **● Phenazine**



- **Phenazines**
- Ring Synthesis 418
- **1,2,3,4-Tetrahydrophenazines**
- Ring Synthesis 416
- **1,2,3,4,6,7,8,9-Octahydrophenazines**
- Ring Synthesis 792
- **● Phenazine-Type Dyes**
- Synthesis 61 (4262)
- **● Phenol Derivatives**
- ***O*-Acylphenols**
- Synthesis 409 (4443), 474 (4470)
- **● Phenols**
- **General**
- Reactions involving the Phenolic Group 611 (4526)
- **Diphenols**
- Synthesis 474 (4470)
- Reactions 418, 477 (4481), 478 (4483)
- **Naphthols**
- Reactions involving the Phenolic Group 418
- **Phenol and Substitution Products**
- from Like Ring Skeletons 281 (4357), 339 (4405), 540 (4501), 542 (4507), 619, 744 (4581)
- Reactions involving the Phenolic Group 186
- **Polyphenols**
- Synthesis 196 (4321)
- Reactions 419
- **● Phosphine Imides**
- Synthesis 33, 50
- Reactions 33, 221
- **● Phosphine Oxides**
- **General**
- Synthesis 115
- **Alkyldiarylphosphine Oxides**
- Synthesis 92
- **Cyclic Bis[phosphine oxides]**
- Synthesis 130 (4301)
- **● Phosphines**
- **General**
- Reactions 103
- **Cyanophosphines**
- Synthesis 735
- **Cyclic Bis-phosphines**
- Synthesis 130 (4301)
- **Dicyanophosphines**
- Synthesis 736
- **Trialkylphosphines**
- Reactions 420
- **Triarylphosphines**
- Reactions 420
- **● Phosphine Selenides**
- Reactions 115
- **● Phosphine Sulfides**
- Reactions 115
- **● Phosphinic Acid Esters**
- Synthesis and Reactions 130 (4301)
- **● Phosphonic Acid Amides**
- Synthesis 656
- **● Phosphonic Acid Esters**
- **Alkanephosphonic Acid Esters**
- Synthesis 44, 413 (4457), 635
- Reactions 413 (4457), 635
- **1-Alkenephosphonic Acid Esters**
- Synthesis 45, 130 (4300)
- **2-Alkenephosphonic Acid Esters**
- Reactions 60 (4256)
- **3-Alkenephosphonic Acid Esters**
- Synthesis 516
- **1-Alkoxycarbonylalkanephosphonic Acid Esters**
- Synthesis 343 (4421)
- Reactions 516
- **1-Cyanoalkanephosphonic Acid Esters**
- Reactions 516
- **1-Haloalkanephosphonic Acid Esters**
- Synthesis 659
- **Heterocyclic Phosphonic Acid Esters**
- Synthesis 130 (4300), 653
- Reactions 653
- **1-Oxoalkanephosphonic Acid Esters**
- Synthesis 44
- **Miscellaneous Types**
- Synthesis 785
- **● Phosphonium Betaines**
- Synthesis 103, 420
- **● Phosphonium Salts**
- **1-Alkenylphosphonium Salts**
- Synthesis and Reactions 737
- **Alkoxy- and Aryloxyphosphonium Salts**
- Synthesis 474 (4469)
- **Alkyltriarylphosphonium Salts**
- Synthesis 540 (4502)
- **Aminophosphonium Salts**
- Reactions 474
- **Bis-phosphonium Salts**
- Synthesis 766
- Reactions 765
- **1-Hydroxyalkylphosphonium Salts and *O*-Derivatives**
- Reactions 797
- **Miscellaneous Types**
- Synthesis 412 (4453)
- **● Phosphoranes**

for Reactions of Alkylidenephosphoranes and Derivatives, *refer also to Reaction Index*, Carbonyl Olefination

- **2-Alkenylidenephosphoranes**
- Synthesis 679 (4552)
- **Alkylidenephosphoranes**
- Synthesis 103
- Reactions 220
- **Bis-phosphoranes**
- Reactions 765
- **● Phosphoric Acid Esters**
- **Cyclic Phosphates**
- Synthesis 637
- **Trialkyl Phosphates**
- Synthesis 99
- **Miscellaneous Types**
- Synthesis 671
- **● Phosphoroamidic Acid Esters**
- Synthesis 507, 637, 714
- Reactions 637
- **● Phosphorochloridic Acid Esters**
- Synthesis 637
- **● Phosphorocyanidous Acid Esters**
- Synthesis 735
- **● Phosphorodiamidic Acid Esters**
- Synthesis 672
- **● Phosphorofluoridic Acid Esters**
- Synthesis 803
- **● Phosphorothioic Acid Esters**
- ***O,O*-Diesters**
- Synthesis and Reactions 270
- ***O,S*-Diesters**
- Synthesis 270
- ***O,O,S*-Triesters**
- Synthesis 638
- **● Phosphorous Acid Esters**
- **Dialkyl Phosphites**
- Reactions 270, 507
- **Trialkyl Phosphites**
- Reactions 785
- **● Polyenecarboxylic Acid Esters (conjugated)**
- Synthesis 679 (4552)
- **● Polyenes (conjugated)**
- from Unlike Carbon Skeletons 679 (4552)
- **● Polyketones**
- Synthesis 506
- **● Prostaglandine Precursors**
- Synthesis 608, 629
- **● Purine**

7*H*-

9*H*-

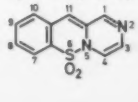
- **7*H*-Purines**
- Ring Synthesis 265
- **9*H*-Purines**
- Ring Synthesis 265
- **1,6-Dihydro-9*H*-Purines**
- Ring Synthesis 345 (4430)
- **1,2,3,6-Tetrahydro-7*H*-purines**
- Ring Synthesis 345 (4428)
- **1,2,3,6-Tetrahydro-9*H*-purines**
- Ring Synthesis 307, 345 (4430)
- **● Pyran**

2*H*–

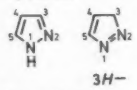
4*H*–

- **Pyrylium Salts**
- Ring-Transformation Reactions 639
- **3,4-Dihydro-2*H*-pyrans**
- Ring Synthesis 34, 262
- **5,6-Dihydro-2*H*-pyrans**
- from Like Ring Skeletons 509
- Ring Synthesis 816 (4619)
- **Tetrahydropyrans**
- Ring Synthesis 509
- **● Pyrazine**

- **Pyrazines**
- Annelation Reactions 731
- **2,3-Dihydropyrazines**
- Ring Synthesis 494
- **Hexahydropyrazines**
- from Like Ring Skeletons 607
- Ring Synthesis 341 (4415)
- **● Pyrazino[1,2-*b*]benzothiazine**

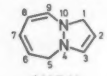


- 1,2,3,4-Tetrahydropyrazino-[1,2-*b*][1,2]-benzothiazines
- Ring Synthesis 289 (4393)
● Pyrazole



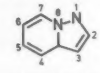
3*H*-

- Pyrazoles
- Ring Synthesis 28, 132 (4309), 200 (4337), 488, 647, 799
- Annelation Reactions 645
- Reactions with Retention of the Ring Skeleton 488
- 2,3-Dihydropyrazoles
- Ring Synthesis 346 (4434), 799
- 2,5-Dihydropyrazoles
- Ring Synthesis 27
- 4,5-Dihydropyrazoles
- Ring Synthesis 27
● Pyrazolo[1,2-*a*][1,2]diazepine

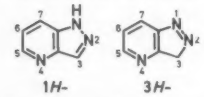


1*H*,5*H*-

- Hexahydropyrazolo[1,2-*a*][1,2]diazepines
- Ring Synthesis 144
● Pyrazolo[1,5-*a*]pyridine

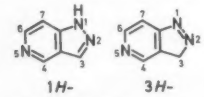


- Ring Synthesis 289 (4392)
● Pyrazolo[4,3-*b*]pyridine



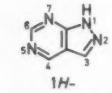
1*H*- 3*H*-

- Ring Synthesis 32
● Pyrazolo[4,3-*c*]pyridine



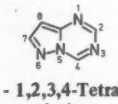
1*H*- 3*H*-

- Ring Synthesis 32
● Pyrazolo[3,4-*d*]pyrimidine



1*H*-

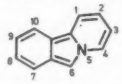
- 1*H*-Pyrazolo[3,4-*d*]pyrimidines
- Ring Synthesis 645
- 4,5,6,7-Tetrahydro-1*H*-pyrazolo[3,4-*d*]-pyrimidines
- Ring Synthesis 645
● Pyrazolo[2,3-*a*]-1,3,5-triazine



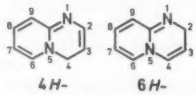
- 1,2,3,4-Tetrahydropyrazolo-[2,3-*a*]-1,3,5-triazines
- Ring Synthesis 313
● Pyridazine

- Synthesis 35
● Pyridine

- Pyridines
- from Like Ring Skeletons 706
- Ring Synthesis 32, 66 (4289), 191, 201 (4343), 338 (4404)
- Annelation Reactions 731
- Reactions with Retention of the Ring Skeleton 633
- Pyridinium Betaines
- Reactions 338 (4404)
- Pyridinium Salts
- from Like Ring Skeletons 202 (4346), 440
- Reactions with Retention of the Ring Skeleton 284 (4372)
- Pyridinium Ylids
- Reactions 290 (4395)
- 1,2-Dihydropyridines
- Ring Synthesis 32
- 1,4-Dihydropyridines
- from Like Ring Skeletons 284 (4372)
- Ring Synthesis 32, 202 (4345), 491
- 3,4-Dihydropyridines
- Ring Synthesis 491
- 1,2,3,4-Tetrahydropyridines
- from Like Ring Skeletons 426, 440, 625
- Ring Synthesis 32, 643
- Annelation Reactions 427
- Piperidines
- Ring Synthesis 141, 491, 590, 600
● Pyrido[2,1-*a*]isoindole

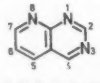


- 1,2,3,4,6,6a,7,8,10a,10b-Decahydropyrido-[2,1-*a*]isoindoles
- Ring Synthesis 132 (4310)
● Pyrido[1,2-*a*]pyrimidine

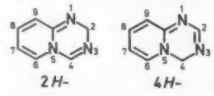


4*H*- 6*H*-

- Pyrido[1,2-*a*]pyrimidinium Salts
- Ring Synthesis 202 (4346)
- 1,2,3,4,6,7-Hexahydro-6*H*-pyrido[1,2-*a*]-pyrimidines
- Ring Synthesis 427
● Pyrido[2,3-*d*]pyrimidine

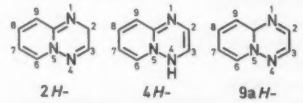


- 1,2,3,4-Tetrahydropyrido[2,3-*d*]pyrimidines
- Ring Synthesis 313
● Pyrido[1,2-*a*]-1,3,5-triazine



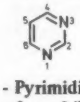
2*H*- 4*H*-

- 3,4-Dihydro-2*H*-pyrido[1,2-*a*]-1,3,5-triazines
- Ring Synthesis 313
● Pyrido[1,2-*b*][1,2,4]triazine



2*H*- 4*H*- 9a*H*-

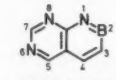
- 1,2-Dihydro-9a*H*-pyrido[1,2-*b*][1,2,4]tri-azines
- Ring Synthesis 290 (4395)
● Pyrimidine



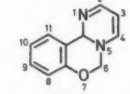
- Pyrimidines
- from Like Ring Skeletons 289 (4394)
- Ring Synthesis 35, 201 (4342), 202 (4344), 346 (4435), 488
- Annelation Reactions 265, 345 (4430)
- Reactions with Retention of the Ring Skeleton 443
- 1,2-Dihydropyrimidines
- Ring Synthesis 490
- 2,5-Dihydropyrimidines
- Ring Synthesis 346 (4435)
- 3,4-Dihydropyrimidines
- Ring Synthesis 134 (4317), 289 (4394), 485
- 3,4-Dihydropyrimidinium Betaines
- Synthesis and Reactions 248
- 1,2,3,4-Tetrahydropyrimidines

see also: Uracils

- Ring Synthesis 51, 406, 648
- Annelation Reactions 405
- 1,4,5,6-Tetrahydropyrimidines
- Ring Synthesis 294, 309, 344 (4424)
- 1,4,5,6-Tetrahydropyrimidinium Betaines
- Synthesis 103
- 1,4,5,6-Tetrahydropyrimidinium Salts
- from Like Ring Skeletons 654
- Hexahydropyrimidines
- Ring Synthesis 654
- Reactions with Retention of the Ring Skeleton 654
● Pyrimido[4,5-*e*][1,2]azaborin

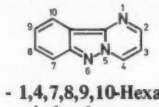


- 1,2-Dihydropyrimido[4,5-*e*][1,2]azaborins
- Ring Synthesis 154
● Pyrimido[1,2-*c*][1,3]benzoxazine

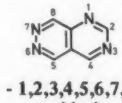


11b*H*-

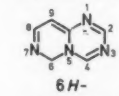
- 1,4-Dihydro-11b*H*-pyrimido[1,2-*c*][1,3]-benzoxazines
- Ring Synthesis 803
- 3,4-Dihydro-11b*H*-pyrimido[1,2-*c*][1,3]-benzoxazines
- Ring Synthesis 803
● Pyrimido[1,2-*b*]indazole



- 1,4,7,8,9,10-Hexahydropyrimido[1,2-*b*]-indazoles
- Ring Synthesis 35
● Pyrimido[4,5-*d*]pyridazine

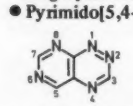


- 1,2,3,4,5,6,7,8-Octahydropyrimido[4,5-*d*]-pyridazines
- Ring Synthesis 406
● Pyrimido[3,4-*a*][1,3,5]triazine



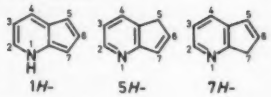
6*H*-

- 1,2,3,4,7,8-Hexahydro-6*H*-pyrimido[3,4-*a*]-[1,3,5]triazines
- Ring Synthesis 648
● Pyrimido[5,4-*e*][1,2,4]triazine



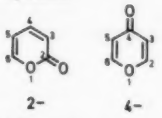
- 1,5,6,7-Tetrahydropyrimido[5,4-*e*][1,2,4]-triazines
- Ring Synthesis 177
- 5,6,7,8-Tetrahydropyrimido[5,4-*e*][1,2,4]-triazines

- Ring-Synthesis 177
● 1-Pyrindine



1*H*- 5*H*- 7*H*-

- Ring Synthesis 383
● Pyrones

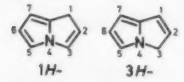


2- 4-

- 2-Pyrones
- from Like Ring Skeletons 192
- Ring Synthesis 259, 652
- Reactions with Retention of the Ring Skeleton 652
● Pyrrole

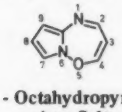
1*H*- 2*H*- 3*H*-

- Pyrroles
- Ring Synthesis 24, 207, 246, 346 (4433), 413 (4458), 414 (4460), 642, 726
- Ring-Transformation Reactions 134 (4315)
- 2,3-Dihydropyrroles
- Ring Synthesis 200 (4336), 288 (4390), 433, 489, 492, 496
- 2,5-Dihydropyrroles
- from Like Ring Skeletons 62 (4265)
- Ring Synthesis 17
- 3,4-Dihydro-2*H*-pyrroles
- from Like Ring Skeletons 221
- Ring Synthesis 295
- 4,5-Dihydro-3*H*-pyrroles
- Ring Synthesis 489
- Pyrrolidines
- Ring Synthesis 17, 24, 141, 144, 214
- Ring-Transformation Reactions 562
● Pyrrolizine

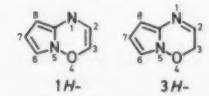


1*H*- 3*H*-

- 3*H*-Pyrrolizines
- Ring-Cleavage Reactions 699
- 2,3-Dihydro-1*H*-pyrrolizines
- Ring Synthesis 24, 207
- Hexahydropyrrolizines
- Ring Synthesis 213
● Pyrrolo[1,2-*b*][1,2,4]oxadiazepine

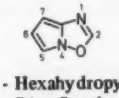


- Octahydropyrrolo[1,2-*b*][1,2,4]oxadiazepinium Salts
- Ring Synthesis 218
● Pyrrolo[1,2-*b*][1,2,4]oxadiazine



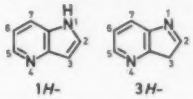
1*H*- 3*H*-

- Octahydropyrrolo[1,2-*b*][1,2,4]oxadiazinium Salts
- Ring Synthesis 218
● Pyrrolo[1,2-*b*]oxadiazole



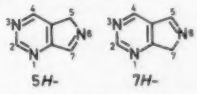
- Hexahydropyrrolo[1,2-*b*][1,2,4]oxadiazoles
- Ring Synthesis 219
● Pyrrolo[1,2-*b*][1,2]oxazole

- 3a,4,5,6-Tetrahydropyrrolo[1,2-*b*][1,2]-oxazoles
- Ring Synthesis 207
- Ring-Transformation Reactions 24
● Pyrrolo[3,2-*b*]pyridine



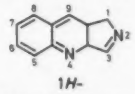
1*H*- 3*H*-

- 2,4,5,6-Tetrahydro-1*H*-pyrrolo[3,2-*b*]pyridines
- Ring Synthesis 26
● Pyrrolo[3,4-*d*]pyrimidine



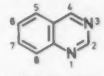
5*H*- 7*H*-

- 1,2,3,4,6,7-Hexahydro-5*H*-pyrrolo[3,4-*d*]-pyrimidines
- Ring Synthesis 406
● Pyrrolo[3,4-*b*]quinoline

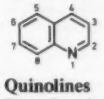


1*H*-

- 2,3-Dihydro-1*H*-pyrrolo[3,4-*b*]quinolines
- Ring Synthesis 34
● Quinazoline



- 1,4-Dihydroquinazolines
- Ring Synthesis 709
- 3,4-Dihydroquinazolines
- Ring Synthesis 187, 339 (4407)
● Quinoline



- Quinolines
- Ring Synthesis 33
- Annelation Reactions 731
- Reactions with Retention of the Ring Skeleton 650
- 1,2-Dihydroquinolines
- Ring Synthesis 34, 740
- Ring-Transformation Reactions 65 (4283)
- 1,4-Dihydroquinolines
- Ring Synthesis 248
- 1,2,3,4-Tetrahydroquinolines
- from Like Ring Skeletons 650
- Ring Synthesis 581
- 5,6,7,8-Tetrahydroquinolines
- Ring Synthesis 32
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- Anthraquinones
- Ring Synthesis 324
- *o*-Benzoquinones
- from Like Ring Skeletons 477 (4481), 478 (4483)
- *p*-Benzoquinones
- from Like Ring Skeletons 446, 478 (4483), 671
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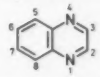
- Reactions not involving the Carbonyl Groups 680 (4555)
- Heterocyclic Fused Quinones
- Synthesis 265
- Polycyclic Quinones
- Ring Synthesis 324
● Quinoxaline



- Quinoxalines
- Ring Synthesis 415, 641
- 1,2-Dihydroquinoxalines
- Ring Synthesis 61 (4262), 420
- 2,3-Dihydroquinoxalines
- Ring Synthesis 416
- 1,2,3,4-Tetrahydroquinoxalines
- Ring Synthesis 657
● Selenides
- Alkyl Aryl Selenides
- Synthesis 338 (4401), 343 (4421)
- Reactions 338 (4401)
● Selenophene

- Ring Synthesis 413 (4458)
● Semiacetals and Derivatives
- *O*-Semiacetal Amides
- Synthesis 197 (4324)
- *S*-Semiacetal Amides
- Synthesis 197 (4324)
- *O,O*-Semiacetals
- Synthesis 60 (4259), 634
- *O,S*-Semiacetals (OH)
- Synthesis 60 (4259)
● Semibullvalenes
- Ring Synthesis 355
● Silanes
- 2-Alkenylsilanes and Derivatives
- Reactions 477 (4482)
- 3-Alkenylsilanes and Derivatives
- Synthesis 542 (4509)
- 1-Alkynylsilanes and Derivatives
- Synthesis 390
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- Arylsilanes and Derivatives
- Synthesis and Reactions 199 (4333)
- Cyanosilanes
- Reactions 181
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- Tetraalkylsilanes
- Reactions 203 (4348)
- Trialkylsilanes Type R_3SiX
- Reactions 50, 787
- Miscellaneous Types
- Synthesis 156
● Silyl Esters
- Silyl Esters of Sulfuric Acid and Derivatives
- Synthesis 50
● Silyl Ethers
- 1-Alkenyl Silyl Ethers
- Synthesis 59 (4251), 410 (4444), 450, 615 (4540)
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- Alkyl Silyl Ethers
- Synthesis 392
- 2-Alkynyl Silyl Ethers
- Synthesis 390
- Silyl Ethers of 1,2-Diols
- Synthesis 787
- Miscellaneous Types
- Reactions 476 (4475)
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- Ring Synthesis 354
● Spheromones
- Synthesis 101
● Spiro Compounds, General
- Carbocyclic Spiro Compounds
- Synthesis 7, 13, 14, 323

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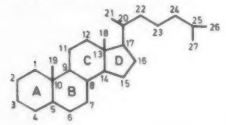

- **General**
- Synthesis 684 (4571)
- Reactions 619
- **Androstatrienes**
- Synthesis 506
- **Cholestanes**
- Synthesis 204 (4354)
- **Cholestenes**
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- **Estratrienes**
- Synthesis 11
- **B-Secosteroids**
- Synthesis 666
● **Stilbenes**
- Synthesis 442
● **Styrenes**
- Synthesis 193
● **Sulfenes**
- Synthesis 103
- Reactions 220
● **Sulfenic Acid Halides**
- Synthesis 169, 573
● **Sulfilimines**
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- Synthesis 55
● **Sulfinic Acid Esters**
- **Alkanesulfinic Acid Esters**
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- Reactions 319
● **Sulfinic Acid Halides**
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- Synthesis and Reactions 649
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- **1-Alkenyl Sulfones**
- Synthesis 279, 453, 519
- **Alkyl Aryl Sulfones**
- Synthesis 519, 722
- Reactions 453, 682 (4563)
- **Cyclic Sulfones**
- Synthesis 288 (4388), 289 (4391)
- Reactions 55, 103
- **Diaryl Sulfones**
- Synthesis 130 (4299)
- **1,1-Dihaloalkyl Sulfones**
- Synthesis and Reactions 545 (4520)
- ***gem*-Disulfones**
- Synthesis 287 (4383)
- **1-Haloalkyl Sulfones**
- Synthesis 333, 545 (4520)
- Reactions 545 (4520)
- **Heterocyclic Sulfones (Het-SO_2-Het, Het-SO_2-R)**
- Synthesis 500, 526, 633, 722
- **2-Oxoalkyl Sulfones**
- Synthesis and Reactions 63 (4272)
- **α-Sulfonylcarboxylic Acid Derivatives**
- Synthesis and Reactions 815 (4615)
- **Miscellaneous Types**
- Synthesis 287 (4384)
● **Sulfonic Acid Amides**
- **General**
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- **Alkanesulfonamides**
- Synthesis 321
- **1-Alkenesulfonamides**
- Synthesis 321
- **Miscellaneous Types**
- Synthesis 48
● **Sulfonic Acid Anhydrides**
- Synthesis and Reactions 130 (4299)
● **Sulfonic Acid Halides**
- **Sulfonyl Chlorides, General**
- Synthesis 321
- **Sulfonyl Fluorides, General**
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- Synthesis 39
● **Sulfonic Acids**
- **General**
- Reactions 340 (4413)
- **Alkanesulfonic Acids**
- Synthesis 90, 321
- **1-Hydroxyalkanesulfonic Acid and *O*-Derivatives**
- Reactions 277
● **Sulfonium Betaines**
- Synthesis 334
● **Sulfonium Salts**
- Synthesis 334, 346 (4432)
- Reactions 334, 346, 798
● **Sulfonothioic Acid Esters**
- ***S*-Esters**
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- **General**
- Reactions 386
- **1-Alkenyl Sulfoxides**
- Synthesis 279
- **Alkyl Aryl Sulfoxides**
- Synthesis 319
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- **Dialkyl Sulfoxides**
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- Synthesis 500
- **2-Oxoalkyl Sulfoxides**
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- Synthesis 77
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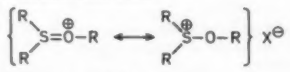
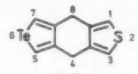
● **Sulfoximines**
- Synthesis and Reactions 521
● **Sulfoxonium Salts**

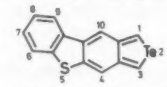


- Synthesis and Reactions 145
● **Sulfuranes**
- Synthesis 199 (4331)
- Reactions 288 (4389), 484, 798
● **Sulfuric Acid Esters**
- Synthesis and Reactions 611 (4526)
● **Telluropheno[3,4-*f*]-2-benzothiophene**



4*H*,8*H*-

- Ring Synthesis 265
● **Telluropheno[3,4-*b*]dibenzothiophene**



- **4,10-Dihydrotelluropheno[3,4-*b*]dibenzothiophene**
- Ring Synthesis 265
● **Terpenes**
- **Acyclic Monoterpenes**
- Reactions 5, 16
- **Cyclic Monoterpenes**
- Synthesis 5, 16
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- Reactions 276
- **Monoterpenes**
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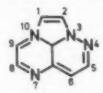
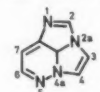
- Synthesis 67, 624
- **Triterpenes**
- Reactions 331, 795
- **Miscellaneous Types**
- Reactions 781
● **2a,3,6,8a-Tetraazaacenaphthylene**



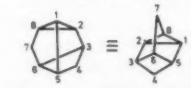
- **2a,3,6,8a-Tetraazaacenaphthylenium Salts**
- Ring Synthesis 175
● **1,2a,4a,5-Tetraazacyclopenta[*cd*]indene**



- **1,2-Dihydro-1,2a,4a,5-tetraazacyclopenta-[*cd*]indenium Salts**
- Ring Synthesis 175
● **Tetracyclo[3.2.0.0.^{2,6}.0^{3,5}]heptanes**

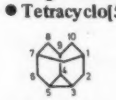
- Ring Synthesis 428
● **Tetracyclo[3.3.1.0^{2,4}.0^{6,8}]nonanes**

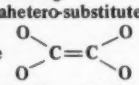
- Ring Synthesis 636
● **Tetracyclo[3.3.0.0^{2,8}.0^{3,6}]octanes**

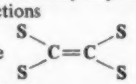


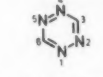
- Reactions with Retention of the Ring Skeleton 175
● **Tetracyclo[7.0.0^{2,4}.0^{5,7}]octanes**

- Ring Synthesis 348
- Ring-Transformation Reactions 348
● **Tetracyclo[5.3.1.0.^{3,5}.0^{4,9}]undecanes**

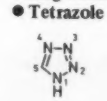


- Ring-Cleavage Reactions 429
● **Tetrahetero-substituted Ethylenes**
- Type 

(Tetraalkoxyethylenes)
- Reactions 260
- Type 
- Synthesis 168
● **1,2,4,5-Tetrazine**



- Ring-Transformation Reactions 488
● **Tetrazole**



- Ring Synthesis 31
● *N*-Thallio Compounds
- Synthesis and Reactions 39
● 4-Thia-1-azabicyclo[3.2.0]heptane

- Ring-Transformation Reactions 548, 551, 573, 580, 583, 586
● 3-Thia-1-azabicyclo[3.1.0]hexanes

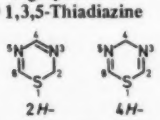
- Ring Synthesis 577
● 3-Thiabicyclo[3.2.0]heptane

- 3-Thiabicyclo[3.2.0]hepta-1,4,6-trienes
- Ring Synthesis 767
● 5-Thia-1,3-diazabicyclo[4.1.0]heptane

- 5-Thia-1,3-diazabicyclo[4.1.0]hept-3-enes
- Ring Synthesis 490
- Ring-Transformation Reactions 490
● 4-Thia-1,6-diazabicyclo[3.3.0]octane

- Ring Synthesis 583
● 1,3,5-Thiadiazepine

- 4,7-Dihydro-1,3,5-thiadiazepines
- Ring Synthesis 490
● 1,3,5-Thiadiazine

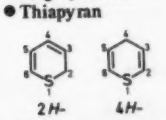


2*H*- 4*H*-

- 4*H*-1,3,5-Thiadiazines
- Ring Synthesis 267
- Ring-Transformation Reactions 167
- Tetrahydro-1,3,5-thiadiazines
- Ring Synthesis 675
- Ring-Transformation Reactions 675
● 1,2,3-Thiadiazole

- 1,2,3-Thiadiazoles
- Ring Synthesis 308
- 1,3,4-Thiadiazolium Ylids
- Ring Synthesis 345 (4429)
● 1,2,4-Thiadiazole

- 2,5-Dihydro-1,2,4-thiadiazoles
- Ring-Cleavage Reactions 65 (4280)
- Tetrahydro-1,2,4-thiadiazoles
- Ring Synthesis 53
● Thiapyran

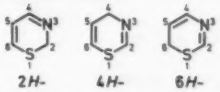


2*H*- 4*H*-

- Thiapyrylium Salts
- Ring Synthesis 639
- Thiacyclohexanes
- Ring Synthesis 308
- Reactions with Retention of the Ring Skeleton 639
● 1,2,3,4-Thiatriazole

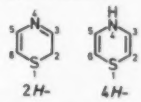
- 1,2,3,4-Thiatriazoles
- Ring Synthesis 52
- 4,5-Dihydro-1,2,3,4-thiatriazoles
- from Like Ring Skeletons 52
- Ring Transformation Reactions 53
● 1,3-Thiazete

- 1,3-Thiazetidines
- Ring Synthesis 308
● 1,3-Thiazine



2*H*- 4*H*- 6*H*-

- 6*H*-1,3-Thiazines
- Annelation Reactions 571
- Tetrahydro-1,3-thiazines
- Ring Synthesis 66 (4290)
● 1,4-Thiazine



2*H*- 4*H*-

- 2*H*-1,4-Thiazinium Salts
- Ring Synthesis 586
● 1,2-Thiazole

- 1,2-Thiazoles
- Ring Synthesis 26, 309
- 2,5-Dihydro-1,2-thiazoles
- Ring-Cleavage Reactions 65 (4280)
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- 1,3-Thiazoles
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- 4,5-Dihydro-1,3-thiazoles
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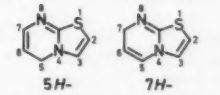
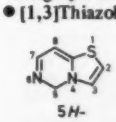
- 2,3-Dihydro-1,3-thiazolium Salts
- from Like Ring Skeletons 377
- Tetrahydro-1,3-thiazoles
- Ring Synthesis 343 (4423)
● [1,3]Thiazolo[3,2-*a*]pyrimidine



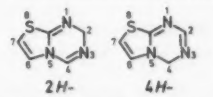
5*H*- 7*H*-

- 2,3-Dihydro-5*H*-[1,3]thiazolo[3,2-*a*]pyrimidines
- Ring Synthesis 580
● [1,3]Thiazolo[3,2-*c*]pyrimidine



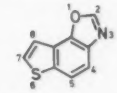
5*H*-

- Hexahydro[1,3]thiazolo[3,2-*c*]pyrimidines
- Ring Synthesis 580
● [1,3]Thiazolo[3,2-*a*][1,3,5]triazine

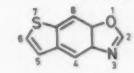


2*H*- 4*H*-

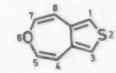
- 3,4-Dihydro-2*H*-[1,3]thiazolo[3,2-*a*][1,3,5]-triazines
- Ring Synthesis 311
● Thieno[2,3-*g*][1,3]benzoxazole



- Ring Synthesis 201 (4340)
● Thieno[3,2-*f*][1,3]benzoxazole



- Ring Synthesis 201 (4340)
● Thieno[3,4-*d*]oxepin



- Ring Synthesis 769
● Thiete

- Thietes
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- Thietanes
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● Thiirene

- Thiirenes
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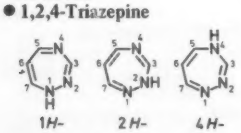
- **1,2,4-Triazepine**



1*H*- 2*H*- 4*H*-

- **2*H*-1,2,4-Triazepines**
- Ring Synthesis 488
- **6*H*-1,2,4-Triazepines**
- Ring Synthesis 488
- **1,2,4-Triazine**

- **1,2,4-Triazines**
- Ring Synthesis 288 (4389)
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- **1,4,5,6-Tetrahydro-1,2,4-triazines**
- Ring Synthesis 36
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- **1,3,5-Triazines**
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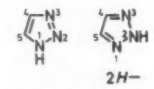
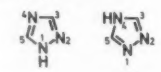
- **1,3,6-Triazocine**

- **1,2,5,6-Tetrahydro-1,3,6-triazocines**
- Ring Synthesis 490
- **1,2,3-Triazole**



2*H*-

- **2*H*-1,2,3-Triazoles**
- Ring Synthesis 31
- **4,5-Dihydro-1,2,3-triazoles**
- Ring-Transformation Reactions 251
- **1,2,4-Triazole**



4*H*-

- **1,2,4-Triazoles**
- from Like Ring Skeletons 292
- Ring Synthesis 30, 308, 609
- **1,2,4-Triazolium Ylids**
- Ring Synthesis 345 (4429)
- **4,5-Dihydro-1,2,4-triazoles**
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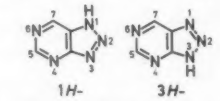
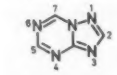
- Ring Synthesis 414 (4461), 649
- **[1,2,3]Triazolo[4,5-*d*]pyrimidine**

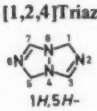


1*H*- 3*H*-

- Ring Synthesis 443
- **[1,2,4]Triazolo[2,3-*a*][1,3,5]triazine**

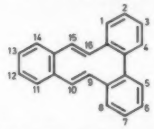


- **4,5,6,7-Tetrahydro[1,2,4]triazolo[2,3-*a*]-[1,3,5]triazines**
- Ring Synthesis 313
- **[1,2,4]Triazolo[1,2-*a*][1,2,4]triazole**

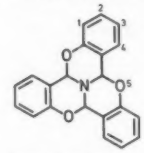


1*H*,5*H*-

- **Tetrahydro[1,2,4]triazolo[1,2-*a*][1,2 4]triazoles**
- Ring Synthesis 414 (4461)
- **Tribenzo[*a*,*c*,*g*]cyclodecene**

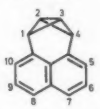


- Ring Synthesis 772
- **Tricyclobenzoxazines**



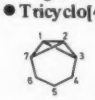
- Ring Synthesis 501
- **Tricyclo[4.2.2.0^{2,5}]decane**

- **Tricyclo[4.2.2.0^{2,5}]deca-3,7-dienes**
- Ring Synthesis 399
- **Tricyclo[4.2.2.0^{2,5}]deca-3,7,9-trienes**
- from Like Ring Skeletons 399
- **Tricyclo[4.1.0.0^{2,4}]hepta[4,5,6-*de*]naphthalene**



- Ring Synthesis 349
- **Tricyclo[3.2.0.0^{2,4}]heptane**

- Ring-Transformation Reactions 350
- **Tricyclo[4.1.0.0^{2,7}]heptane**



- Ring Synthesis 347
- Ring-Transformation Reactions 348
- **Tricyclo[2.2.0.0^{2,6}]hexanes**

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- **Tricyclo[4.2.1.0^{2,5}]nonane**

- **Tricyclo[4.2.1.0^{2,5}]non-7-enes**
- Ring Synthesis 173
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- **Tricyclo[3.2.1.0^{2,4}]octanes**
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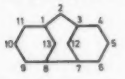
● **Tricyclo[6.3.1.0^{3,7}]tridecane**



- Ring Synthesis 5

● **Tricyclo[3.3.3.0^{1,5}]undecane**

- Ring Synthesis 16

● **Tricyclo[5.3.1.0^{4,9}]undecane**

- **Tricyclo[5.3.1.0^{4,9}]undec-5-enes**
- Ring Synthesis 428

● **1,3,5-Trithians**

- Ring-Cleavage Reactions 284 (4370)

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- **1,2,3-Trithians**
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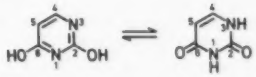

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- Ring Synthesis 202 (4344)
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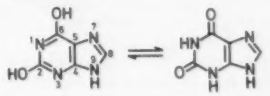
see: Dithiocarbonic Acid Esters

● **Xanthines**



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- - N–C–N + C–C–C 134 (4317), 427
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- *S–C–S–C–C–C*
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– C_5N –

- N–C–C–C + C–C 34
- - C–N–C–C + C–C 201 (4343)
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- - O–C–C–C–C + C 797
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- - C–C–C–C + C–O 98
- - O–C–C + C–C–C 259

– C_5S –

- - C–C–C + S–C + C 308

– C_6 –

- - C–C–C–C + C–C 611 (4525)
- - C–C–C + C–C–C 282 (4359), 431

→ **7 Ring Atoms**

– C_5N_2 –

- *N–C–C–N–C–C–C*
- - N–C–C–C–N + C–C 657

– C_5S_2 –

- *S–C–S–C–C–C–C*
- - S–C–C–C–C–S + C 720

– C_6N –

- - C–C–C–C + N–C–C 486

– C_6O –

- - C–C–C–C + C–O–C 769

– C_7 –

- - C–C–C–C + C–C–C 282 (4359), 768

→ **8 Ring Atoms**

– C_6N_2 –

- *N–C–C–N–C–C–C–C*
- - N–C–C–N + C–C–C–C 246

– C_8 –

- - C–C–C–C + C–C–C–C 769

→ **9 Ring Atoms**

– C_3O_6 –

- *O–O–C–O–O–C–O–O–C*
- - O–O–C–O–O–C–O–O + C 388

– C_8O –

- - C–C–C–C–C–C–C + C–O–C 771

– C_8S –

- - C–C–C–C–C–C–C + C–S–C 771

– C_9 –

- - C–C–C–C–C–C–C + C–C–C 771

→ **Bicyclo[3.3.1]Systems**

– $C_5N–C_5N$ –

- - C–C–C + C–C–C + N + N + C 134 (4319)

→ **5,5-Systems, fused**

– $C_3NO–C_5$ –

- - C–C–C–C–C–C–C + O–N 211

→ **5,6-Systems, fused**

– $C_3N_2–C_4NO$ –

- - O–C–C–C–N–C–C–N + C 325

– $C_4N–C_6$ –

- - C–N–C–C–C + C–C–C–C 132 (4310)

→ **6,6-Systems, fused**

– $C_6–C_6$ –

- - C–C–C–C–C + C–C–C–C–C 425

→ **6,6,6-Systems, fused**

– $C_4NO–C_4NO–C_4NO$ – 501

● **Cyclocondensation (Intermolecular, Transannular)**

→ **Bicyclo[3.2.1]Systems**

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- from 5-Membered Rings 134 (4315)

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- Aliphatic Carboxylic Acids + Polyphosphoric Acid 608
- ω-Arylaldehyde Acetals + Acids 482 (4499)
- Carbonyl-Methylene Condensation 61 (4262), 200 (4337)
- Cinnamic Aryl Esters or *N*-Arylamides + Aluminum Chloride 740
- Phosphoranylidenaldehydes, Carbonyl Olefination 559
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- Amino-ketones + Acid 202 (4346)
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- **General (C → O)**
- Oxocarboxylic Acid Esters + Acid 259
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– C_3 – 542 (4508)

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– C_3N –

- - C–N Ring Closure 97

– C_4 – 542 (4508)

- **1,5-Cyclization**

– C_2N_2O –

- *O–C–N–N–C*
- - C–O Ring Closure 133 (4313)

– C_3NO –

- *O–C–N–C–C*
- - C–O Ring Closure 724, 725

– C_3NS –

- *S–C–N–C–C*
- - C–S Ring Closure 675

– C_3N_2 –

- *N–N–C–C–C*
- - C–C Ring Closure 200 (4337)
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- - C–N Ring Closure 294, 511

– C_3S_2 –

- *S–C–S–C–C*

-- C–S Ring Closure 66 (4287)
– C_4N –
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-- C–O Ring Closure 346 (4432)
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- 1,6-Cyclization
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-- C–O Ring Closure 201 (4343)
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- *N–C–N–C–C–C*
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-- C–S Ring Closure 451
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- *O–C–O–C–C–C*
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- *S–C–C–S–C–C*
-- C–S Ring Closure 451
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-- C–N Ring Closure 597
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- *O–N–C–C–N*
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– C_3NS –
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